United States
Department of
Agriculture

Forest
Service

FS-415

Central Tire Inflation

What's In It For Me?

Modern logging truck.

1920's logging truck.

History of Reduced-Pressure Tires for Logging

In the early years of the 20th century, drivers conceived the idea that softer tires could do much to improve the operation of logging trucks. Specifically, in the mid-1920's, an attempt was made to provide a softer tire by first thickening the cross section of the solid rubber tire in use at the time and then putting holes through the rubber to produce some "give" in the tire. Logging operations did improve, increasing the demand for softer tires and leading ultimately to the idea of a pneumatic tire. In the late 1920's, pneumatic tires came into use.

Then, in 1934, Lloyd Christensen (a log trucker who worked in Oregon and Washington) and the Goodyear Tire & Rubber Co. developed the 14-ply, 10.00 x 20 tire that became the standard in log trucking for many years. In succeeding decades, tires on logging trucks have had their pressures increased time after time due to increased loads and speeds–until these days pressure is in the 90-120 psi range. Once again loggers are experiencing the road damage, traction problems, and excessive truck maintenance that they did with early solid rubber tires. They could minimize these problems by installing central tire inflation in their logging trucks.

What is Central Tire Inflation?

Central tire inflation (CTI) is the term used for a mechanical system, installed on a vehicle, that **allows the driver to adjust tire pressure while the vehicle is in motion.** With CTI, tire pressures can be varied to realize the maximum benefit for any given load, speed, and road condition. The fuel efficiency and tire-life benefits of using high pressures on high-speed highways can be realized while–at the same time–all the benefits of reduced-pressure tires on low-speed forest roads can be achieved.

Benefits of Reduced-Pressure Tires on Low-Speed Forest Roads

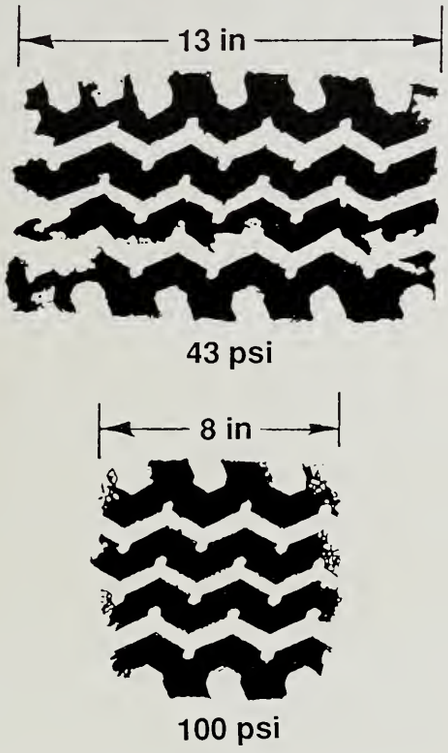
A reduced-pressure tire results in a longer tire footprint, the area of tire contact with the road surface; this prevents the bouncing that results from short contact lengths. "Bounce" causes the tire to hop on paved roads and to "washboard" unpaved ones. The U.S. Army has utilized CTI since World War II to improve vehicle mobility. Benefits of operating reduced-pressure tires on low-speed forest roads include:

- Decreased road surface damage.
- Decreased road maintenance needs.
- Decreased use of road-surfacing material.
- Decreased truck maintenance needs.
- Decreased tire damage.
- Subdued vibrations to driver, passengers, and cargo.
- Increased truck mobility.
- Extended haul season.

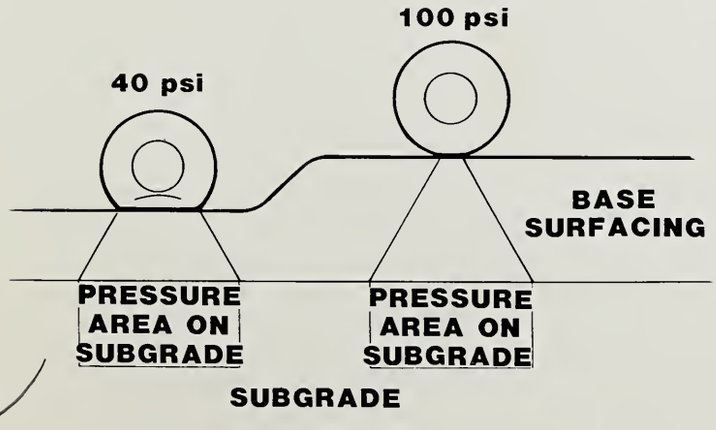
In addition, the Forest Service has learned from tests of reduced-pressure tires that they provide additional benefits by:

- Healing rutted and washboarded unpaved roads.
- Increasing the life of road pavement over saturated subgrade conditions.

Adequate tire pressure must be maintained for highway speeds. CTI systems are being used to attain both high tire pressure for highways and appropriately lowered tire pressure for low-speed forest roads.



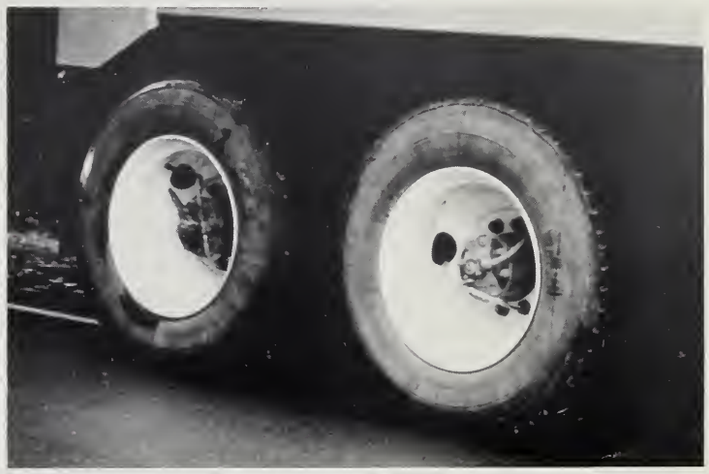
When tire pressure in a modern radial truck tire is reduced, the tire footprint is greatly increased in length (although little, if any, in width). This increase in the tire footprint greatly reduces the stress applied to the road surface.



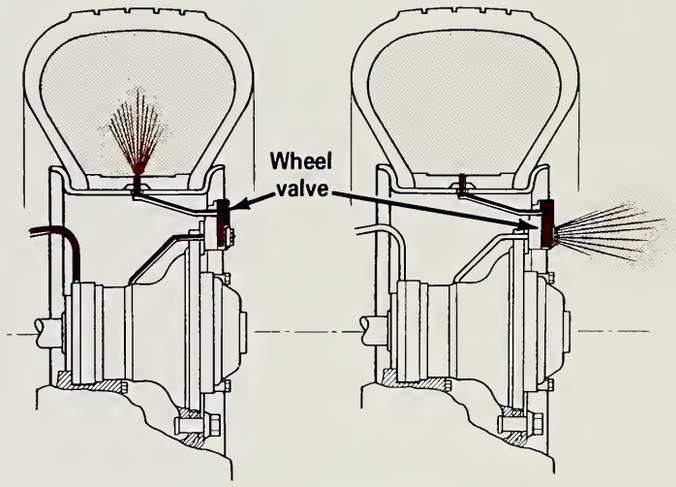
Because the tire footprint is longer, pressure on the road is reduced. This greatly reduces the thickness of road aggregate required to spread the load to a pressure appropriate for the underlying subgrade materials.

How Does CTI Inflate a Rolling Tire?

Compressed air is supplied to the system by the air brake compressor (a fail-safe priority valve assures brake operation). Control valves route the air from the fixed-axle housing, or brake plate, through a seal to the rotating wheel, axle shaft, or hub.



The air lines on the drive wheels allow air to pass from the rotating seals to each individual tire.



Internal CTI system on drive wheels: When the tire is being inflated (left), air is routed from the truck's compressor through the rotating air seal to the tire. When it is being deflated (right), the air flows back through the wheel valve to a discharge port.

Advantages of CTI

The Forest Service has been investigating the advantages of using CTI since 1983. Since the vast majority of the total Forest Service road mileage is gravel or native surfaced, a significant portion of the agency's budget is used for road construction and maintenance. These roads are utilized both for public access and for protecting and transporting national forest resources.

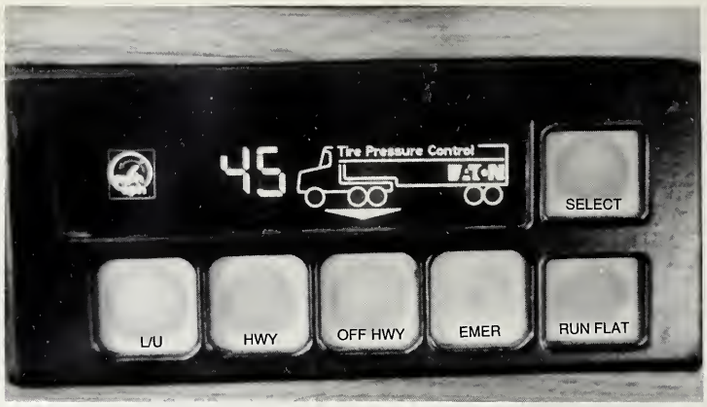
Finding ways to reduce the costs of constructing and maintaining these roads is an Agency goal. Tests conducted by the Forest Service throughout the United States show dramatic improvements in road conditions brought about by the use of increased tire footprint made possible by CTI systems. In addition to the benefits already cited, CTI systems can offer the following advantages:

- Constant monitoring of tires to detect leaks.
- Inflation of leaking tires to prevent flats.
- Quick inflation/deflation using switch in cab.

For additional information on CTI, contact:

USDA Forest Service
San Dimas Technology & Development Center
444 East Bonita Avenue
San Dimas, CA 91773

Telephone: 909/599-1267; FAX: 909/592-2309



Drivers can adjust tire pressure from the cab by using the CTI controller.

Revised June 1993